Geophysical Research Abstracts,
Vol. 10, EGU2008-A-09118, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-09118
EGU General Assembly 2008

Effects of data availability and system properties on both sensitivity and accuracy of calculated seepage fluxes in wetlands

D.G. Cirkel (1,2), J.P.M. Witte (1,3), S.E.A.T.M. van der Zee. (2)

(1) Kiwa Water Research, Nieuwegein, The Netherlands, (2) Wageningen University, Environmental Sciences Group, Wageningen, The Netherlands, (3) Vrije Universiteit, Amsterdam, The Netherlands (gijsbert.cirkel@kiwa.nl)

Mesotrophic species rich fen meadows (*Circio Molinietum*) are often confined to seepage areas. The conservation value of the vegetation is often very high, since it harbors rare and threatened species like various orchids and sedges. Ecohydrological research carried out in the 80s and 90s contributed to the notion that these ecosystems are bound to the inflow of nutrient poor alkaline seepage. The inflow contributes to a stable and high groundwater level and to pH buffering in the root zone. Due to the intriguing high biodiversity, seepage dependent vegetations have been an important field of research for long. However, in spite of all these studies a quantitative relationship between seepage and the occurrence of seepage dependant species or vegetation types is still lacking. Aim of our research is to develop a quantitative relationship between seepage intensity (characterized by amount and dynamics) and vegetation. We collected a dataset with a large amount of vegetation records for which the soil soil has been described and the groundwater level has been measured fortnightly during a period of at least two years. The seepage intensity is a typical hydrological parameter that cannot be measured directly but that can be inferred by calibration of a hydrological model. To calculate the seepage intensity on the scale of the vegetation stands, a dynamic one-dimensional model for variably saturated water flow (SWAP) was applied. This model includes interaction with the plant/atmosphere, a deeper aquifer and the surface water system.

An important question is how accurate seepage intensities can be computed, given the availability and accuracy of input data and given system properties like non-linearity and reaction time. To answer this question, virtual plots were constructed with different parameter combinations, representing realistic geohydrological situations in the Netherlands. The ranges of mode parameters were chosen to represent seepage dependent wetland ecosystems.

Subsequently, selections of (i)phreatic groundwater level, (ii)surface water level and (iii)hydraulic head in the underlying (semi-confined) aquifer with different time intervals, were taken from the model output and considered as ‘measurements’ in the next step of the analysis. In this next step, the Shuffled Complex Evolution Metropolis algorithm (SCEM-UA) was used to optimize model parameters describing the interaction between ground and surface water (including runoff) and the phreatic and deep aquifer. Subsequently time series of seepage intensity are simulated using the optimized models for each virtual plot and compared with the *a priori* known seepage intensity time series.

Our work revealed the achievable accuracy of simulated seepage intensities given certain system properties and available measured data, which can be used for the dataset under study. More generally, we identified which parameter combinations and are in control in limiting the accuracy of the modeled upward seepage. When setting up a monitoring program the results can help to decide what and when to measure.